sary. Now we know that the α radiation given out during one radio-active transformation is, in fact, homogeneous.

A most peculiar property of aurora is the formation of parallel bands. It seems as if the bands were mutually connected in some way. When one band leads the others will form similar equidistant curves, and it is frequently observed that if one of the bands moves, the others will undertake a similar movement.

I think these most peculiar properties will be immediately understood if we assume each band to be produced by its own homogeneous radiation, and that the homogeneous radiations corresponding to the various bands start from the same source. If so, the various groups will be subject to the same conditions, with the exception that they will be slightly differently bent by the fields of force which they have to pass through on their way to the polar regions. If, therefore, one homogeneous bundle makes itself felt as a thin luminous band along the magnetic parallel, the rays from the other groups, having started under the same initial conditions, must give rise to bands similar in form, but with a difference in position, corresponding to the difference of stiffness of the various groups.[1]

Now the existence of homogeneous groups given out from the same source is a simple consequence of the α-ray hypothesis, because a number of different radio-active compounds will be formed through the atomic disintegration and eject groups of homogeneous α radiations.

In that way the auroral drapery bands should form a kind of *magnetic spectrum* of the α rays given out by some radio-active matter present at the sun. Thus a possibility opens out of studying and identifying the radio-active substances on the sun by examining the magnetic α-ray spectrum produced by the earth's magnetic field in the form of drapery bands.

In the following table is given the "magnetic auroral spectrum" of the radium family calculated on the assumption that the earth's magnetic field is that of an elementary magnet:—

	$\phi_0=16{\cdot}5^\circ$		$h=120$ km.
Substance	d. km.	S_d	β
Radium	0	24	11·5
„ F	24	15	7·2
„ emanation..	39	25	11·9
„ A	64	69	33·0
„ C	133		

ϕ_0 is the angular distance from the magnetic axis to the radium band, which is farthest north, h is the height to which the draperies are supposed to descend, d is the distance from one of the bands to that of radium, S is the distance in km. and β the angular distance between successive bands. The draperies are supposed to be seen near the zenith at the height $h=120$ km. Any attempt at identification with actual observations is hardly possible with the material at my disposal, but such identification may be possible, *e.g.* through the development of the photographic methods. I think, however, that the values found are of the right order.

Summing up, I think we may say that, so far as our present knowledge goes, the properties of auroral drapery bands, and probably other forms of aurora, are well explained by assuming that they are caused by α rays from some radio-active substances on the sun. In order that the rays shall preserve homogeneity, it is necessary that the radio-active matter is distributed in extremely thin layers, and in such a way that the radiation gets out without traversing other kinds of matter.

The arguments in favour of the α-ray hypothesis are, in short, the following:—

(1) The straight-lined structure of the draperies is explained from the small scattering of α rays.

(2) The rapidity with which the luminosity stops at the bottom edge of the band is explained from the "range" of the α rays.

(3) The maximum intensity of the luminosity is explained from the variation of ionisation along the path of the α particle.

(4) The explanation from the radiation theory of the thin drapery bands is in favour of a positive charge, while the diurnal distribution of aurora gives at present very little information in this respect.

(5) The parallel drapery bands are explained from the fact that a mixture of radio-active substances formed by atomic disintegration gives out a mixture of homogeneous groups of α rays.

(6) Calculation of the height of aurora from the relation between velocity and range found by Bragg, Kleeman, and Geiger has shown that α rays with velocities of the same order as found for ordinary radio-active substances would get down to heights varying between 70 and 300 km., which is, indeed, the interval of height most frequently found for aurora.

(7) According to Störmer's calculations, the draperies, when formed by α rays, should appear at an angular distance of about 17° from the magnetic axis, which gives very nearly the right position of the auroral zone.

(8) Radiation of the β-ray type cannot explain the structure of the draperies on account of their great scattering, and being magnetically much softer than the α rays they do not give the right position of the auroral zone.

(9) The spectrum of aurora has not yet been interpreted in terms of spectra physically known. This negative result indicates that the auroral spectrum owes its peculiarities, not so much to the gases present as to the peculiar way in which the light is produced.

In my opinion the spectrum should be produced by α rays penetrating through the upper strata of the atmosphere. It might be possible for those who possess a sufficient quantity of radium to examine the spectrum produced when α rays pass through rarefied gases.

L. Vegard.

University of Christiania, May 30.

Occurrence of a Fresh-water Medusa in Indian Streams.

Dr. Annandale's interesting announcement, in Nature of August 3, of the discovery of a fresh-water Medusa in streams of the Western Ghauts, emboldens me to mention that, at the beginning of the hot season of 1879 or 1880, I saw and handled one of these beautiful little creatures in the lake at Purulia, in Chota Nagpore.

This lake, as I remember it in those years—since when I have never had an opportunity of revisiting it—was a sheet of water of no very great size, and a maximum depth of about 24 feet, said to have been formed by damming the mouth of a wide and shallow ravine so as to catch and hold the ordinary surface drainage. Its flora and fauna were just those of an ordinary Indian "tank"; in the cold season it was used as a sort of port of call by wild-duck; and in the rainy season two little islets that rose above its waters became discordant and unfragrant nurseries of night-herons and snake-birds.

I caught the Medusa—there was only one—when taking my customary morning swim, and though I afterwards kept a look-out, I never saw another.

The few friends to whom I ever mentioned the matter always very politely changed the conversation; but Dr. Annandale's discovery now leads me to think that it might be worth while to look for medusæ in the pools of the Damuda, Subanrika, and Kasi Rivers, which run through Chota Nagpore on their way to the Bay of Bengal.

Heathlands, Belvedere, Kent. A. Alcock.

Interglacial Conditions in the South of England.

Recent observations here through excavations connected with the opening up of the district have enabled me to appreciate the importance of the letter which appeared in Nature (December 15, 1910, p. 206) from Mr. Hazzledine Warren on the "Arctic Plants from the Valley Gravels of the River Lea." He speaks of the evidence as leaving "no doubt that the Pleistocene age was closed by a partial return to glacial conditions, succeeding an epoch when temperate conditions prevailed." Reserving for the moment a discussion in any detail of the evidence now to hand in the upper Valley of the Stort (an affluent of the Lea), I merely wish, with your courtesy, to say now that the physical evidence bears out Mr. Warren's contention;

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[1] See Störmer's papers on corpuscular orbits.

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for we must, I think, recognise hereabouts a younger Boulder Clay as distinct from the "Chalky Boulder Clay" of the Herts and Essex plateau, along with interglacial deposits consisting largely of the outwashings of the older Boulder Clay.

It is easy to understand that a great latitudinal range of variations of climatic conditions in these lowland regions of south Britain would be necessarily contemporaneous with the more definitely marked *altitudinal* variations of the snow-line in the Alpine regions of Britain and Europe, whether from regional subsidence or otherwise. One may venture to say that we have here a record contemporaneous perhaps with that of the "Hessle Boulder Clay" or the "Purple Boulder Clay" (Brit. Mus. "Guide to the Stone Age," p. 8), and with the "Würm" (vierte Vergletscherung) of Alpine glaciation (Credner, "Geologie," tenth edition, p. 739); also Werth, *Globus*, Band xcvi., No. 15, p. 231).

A. Irving.

Bishop's Stortford, August 9.

The Anti-kathodes of X-Ray Tubes.

The special requirements to be fulfilled by materials adapted for use as anti-kathodes are somewhat exacting, and the range of such materials is therefore limited. It is, further, unfortunate that the platinum, tantalum, &c., are in general costly, and that the expense of X-ray tubes is hence, considering their life, high. In casting about for some means of avoiding this difficulty it has occurred to me that carborundum, a material now quite familiar as an abrasive, might be a suitable facing for the anti-kathode. Carborundum, being a product of the electric furnace, is exceedingly refractory; electrically it is a very bad conductor. Messrs. Helm have constructed for me a tube fitted with an anti-kathode from a square inch of carborundum grinding slip, and I have used this tube, so far as my limited laboratory means allow, with perfectly successful results. My coil is only of low power, and I have no means of making any comparative tests of a quantitative type. It seems likely, on theoretical grounds, that the emission from such a tube would be of low penetrative power, but, so far as I can judge, the tube does not seem to pass so readily into the hard condition.

My object in this letter is to bring this matter to the notice of others who are in a position to test the properties of carborundum as an anti-kathode material. If its radiation is of a low penetrative type, such a tube might have advantages in certain superficial treatments in electro-therapeutics, *e.g.* ringworm of the scalp, &c. I should be greatly interested in hearing of any experimental trial.

J. Schofield.

Technical School, Keighley.

The Action of Carbon Dioxide on Litmus.

I write to direct attention to the inaccuracy of a common statement in elementary text-books describing the action on litmus of carbon dioxide in solution.

It is generally stated that the action of carbon dioxide is to turn litmus "wine red," while the fact is that carbon dioxide dissolved in distilled water turns neutral litmus red, just like any other acid.

The cause of the wine-red colour usually obtained is the presence of alkaline bicarbonates as impurities. That this is the case can be seen by adding a drop of ammonia or of sodium carbonate solution to the carbon dioxide solution, when the colour changes, first, from red to blue, and then, after an interval which depends on the amount of alkali added, to the wine red usually associated with the action. A weak solution of lime water acts similarly, and this would seem to give the genesis of the error, as if hard waters are used to make up the solutions the wine-red colour is produced.

The point may not be of the greatest consequence, but it does not seem to be generally known, and the columns of Nature would seem to offer the best means of disseminating, to those whom it chiefly concerns, the knowledge of another "text-book" error.

M. M'Callum Fairgrieve.

The Edinburgh Academy, July 26.

THE BUSHONGO: AN ETHNOGRAPHICAL STUDY OF THE CENTRAL CONGOLAND PEOPLES.[1]

It is difficult to write an adequate review of this work, the result of Mr. Emil Torday's last expedition to central Congoland (1907–9), an expedition in which he was accompanied by Mr. M. W. Hilton-Simpson and a very clever painter, Mr. Norman H. Hardy. Mr. Torday has had the advantage of the collaboration of Mr. T. A. Joyce, of the British Museum and the Royal Anthropological Institute, and Mr. Joyce has been able to bring to bear on the compilation his exceptional knowledge of negro arts, implements, customs, religious beliefs, morals, laws, social life, games, songs, and folklore.

The water-colour drawings by Mr. Norman H. Hardy are, beyond all question, the best that have ever been executed so far in Negroland. They have the absolute fidelity of photographs, with at the same time an appreciation of composition and colour which makes them really works of art. Special instances to justify this praise are:—Plate 5, a masked dancer of the Bangongo (Fig. 1); plate 7, female dancers amongst the Bangongo; plate 8, a Bangongo embroideress; plate 9, a portrait of a Bangongo blacksmith; plate 11, Shika, a young girl of the Isambo tribe; plate 12, a young Bashilele man, with the profile of an ancient Egyptian (Fig. 2); and amongst the black-and-white drawings, plate 17, a study of a native engaged in the manufacture of vegetable salt (Fig. 3), together with certain interiors of houses. Three of the plates referred to are here reproduced in a reduced form.

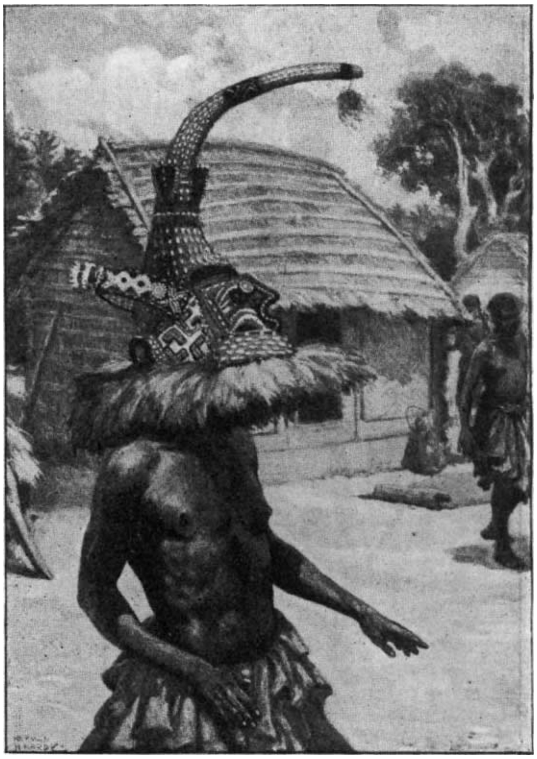

Fig. 1.—A masked dancer of the Bangongo.

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[1] 'Notes Ethnographiques sur les peuples communément appelés Bakuba, ainsi que sur les peuplades apparentées. Les Bushongo." By E. Tordey and T. A. Joyce. Annales du Musée du Congo Belge. Publiées par la Ministère des Colonies. Ethnographie, Anthropologie—Série III: Documents Ethnographiques concernant les populations du Congo Belge. Tome II.—Fascicule I.—Coloured illustrations by Norman H. Hardy. Published by the Museum of the Belgian Congo, Brussels.

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